

# **The Use of Parallel Computing to Simulate Fluid Flow in the Unsaturated Zone of Yucca Mountain, Nevada**

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## **Abstract**

This paper presents the application of parallel computing techniques to large-scale modeling of fluid flow in the unsaturated zone (UZ) at Yucca Mountain, Nevada. In this study, parallel computing techniques, as implemented into the TOUGH2 code, are applied in large-scale numerical simulations on a distributed-memory parallel computer. The modeling study has been conducted using an over-one-million-cell three-dimensional numerical model, which incorporates a wide variety of field data for the highly heterogeneous, fractured formation at Yucca Mountain. The objective of this study is to analyze the impact of various surface infiltration scenarios (under current and possible future climates) on flow through the UZ system, using hydrogeological conceptual models with refined grids. The results indicate that the one-million-cell models produce better resolution results and reveal some flow patterns that cannot be obtained using coarse-grid models.

Keywords: parallel computing, flow modeling, Yucca Mountain, unsaturated zone, numerical simulation